Institut für Festkörperphysik

Abteilung Atomare und Molekulare Strukturen

Leibniz Universität Hannover

Vortragsankündigung

Montag, den 08.05.2023
um 14:00 Uhr
Raum 001
Schneiderberg 39 (LNQE)

spricht

Dr. Doris Reiter

(TU Dortmund)

zum Thema

“State Preparation Schemes for Solid-State Quantum Emitters“

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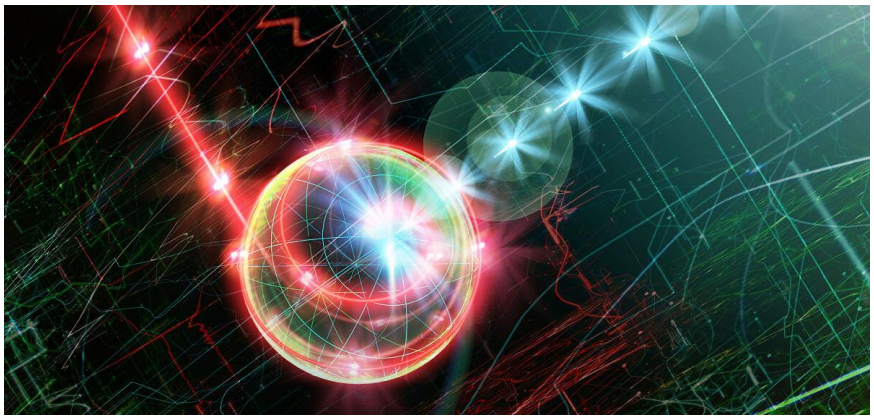
Abstract

A prerequisite for photonic quantum technologies is the generation of specific photon states. Single photons can be created by a two-level quantum emitter, which has been prepared in its excited state, while the generation of entangled photon states requires multi-level quantum systems.
In this talk, I will give an overview over different state preparation schemes for solid-state quantum emitters [1]. As a working horse I will focus on semiconductor quantum dots. A major difference between atomic and solid-state emitters is the interaction with the lattice vibration, i.e., the phonons. In most applications, the phonons are detrimental to the ideal photon generation, such that parameter regimes are identified where their influence is minimal. A special regime is the reappearance regime at strong excitation strength, where the phonons decouple from the electronic degrees of freedom. On the other hand, phonon-assisted preparation schemes make active use of phonons, but is incoherent. I will further introduce the newly found SUPER scheme, in which an excitation below the transition energy with two pulses results in the preparation of the excited state [2,3], which has the promise to lead to excellent single photon properties.
In search for the perfect quantum light emitting device, understanding and implementing the best protocol is an important step towards the realization of quantum devices.



References

[1] S. Lüker and D. E. Reiter, Semicond. Sci. Technol. 34, 063002 (2019)
[2] T. K. Bracht et al., PRX Quantum 2, 040354 (2021)
[3] Y. Karli et al., Nano Letters 22, 6567 (2022)